S
591.55
F2p

STATE DOCUMENTS

Fish and Game Commission

Preliminary investigation of Montana goats in the Continental big game management unit Sun River area, Montana 1946

MSE JAN 12 '77

Montana State Library

3 0864 1006 4786 9

DATE DUE

NOV 1	2013		
GAYLORD 234			PRINTED IN U. S. A.

STATE DOCUMENTS

A PRELIMINARY INVESTIGATION OF MOUNTAIN GOATS IN THE CONTINENTAL BIG GAME MANAGEMENT UNIT SUN RIVER-FLATHEAD AREA MONTANA

JULY, AUGUST, SEPTEMBER 1946

By

Merle Rognrud

THE MONTANA FISH AND GAME COMMISSION
WILDLIFE RESTORATION DIVISION
1-R Project

TABLE OF CONTENTS

Cover
Foreword
Introduction
1. Location & Description of Investigation Area 1
2. Distribution of Mountain Goats 2
3. History of Mountain Goat Populations 3
4. Purpose and Scope of Investigation 4

THE 1946 SUMMER INVESTIGATION
1. PROCEDURE 5
Crew 5
Equipment 7
Route of Travel 7
Methods of Field Observation 8

2. THE MOUNTAIN GOAT
Classification 12
Physical Description 13
Size 13
Weight 13
Pelage 14
Horns 15
Teeth 15
Ears 16
Tail 16
Tracks 16
Glands 16
Feces 17
Voice 17
Senses 17
Mannerisms 18

3. FINDINGS
Distribution and Occurrence (Continental Unit) 20
General 20
Elevation 20
Exposure 21
Slope 25
Cover Type 25
Distance to Water 26

Life History Habits
General Habits 27
Habitat Requirements 27

Digitized by the Internet Archive
in 2014

http://archive.org/details/preliminaryinve1946rogn_0

Water Requirement 27
Daily Movement and Activity 27
Seasonal Movement 29
Flocking, Group Size. 30
Beds 33
Shelters, Caves. 34
Dusting. 34
Sanitation. 34
Licks 34

Food Habits
General 35

Breeding Habits and Reproduction
General 37
Rutting Season. 37
Gestation Period. 37
Birth 37
Number of Young Per Year. 38
Growth of Kids. 38
Longevity, Senescence 38

Ecology of Mountain Goat
Range Use 38
Relation to Other Big Game. 39
Predators 39
Accidents 39
Disease 40

Mountain Goat Census
General 40
Flathead-Sun River. 40
Investigation Area. 44
Herd Composition. 47
Herd, Sex, Age Ratios 48

4. DISCUSSION
Status of Mountain Goat 49
Problems Identified 52

5. MISCELLANEOUS OBSERVATIONS
Big Game
Elk 55
Deer. 56
Bear. 56
Game Birds
General 57
Furbearers
General 57
Predators
General 57

6. RECOMMENDATIONS 57
Summary 58

REFERENCES 62

MAPS
I Goat Range in Montana 2a
II Mountain Goat Range (Continental Unit). 3a
III Travel Route 7a

TABLES
I Mountain Goat Distribution by Elevation 20
II Mountain Goat Distribution by Exposure. 22, 23
III Mountain Goat Distribution by Slope 25
IV Mountain Goat Distribution by Cover Type. 25
V Mountain Goat Seen - Distance to Water. 26
VI Hour of Observation - Mountain Goat Activity. 28
VII Mountain Goat Group Size - Number Observations. . . . 33
VIII Flathead-Sun River Unit, 1946 Mtn. Goat Census. . . . 40
IX Mountain Goat Census, 1946 45
X Seen Mountain Goat Adults 47
XI Mountain Goat Herd Composition. 47

PICTURES
1. Mountain Goat Habitat 1
2. Overnight Camp 6
3. Field Equipment 6
4. Goats are Adept Climbers. 19
5. Mountain Goat Track 24
6. Cave Used by Goats. 24
7. Mountain Goat Group 32
8. Dusting Site 32
9. Goat Observation Point. 50
10. Observational travel. 50

FOREWORD

In this report an attempt has been made to assemble and organize all available mountain goat data which would be of value in the management of this species or which might contribute to a future more detailed study. Field data collected during the investigation were not sufficient for extensive conclusions on life history, habits and requirements. However, the goat range in this area was mapped, the 1946 census made, herd status determined, and many problems outlined for future investigation. In addition, methods of operational procedure for mountain goat study were worked out, and miscellaneous information collected.

The splendid cooperation of the U. S. Forest Service is hereby acknowledged. The Zoology Department and Forestry School of the Montana State University contributed information and suggestions for this investigation. The Glacier National Park Service supplied additional mountain goat information as did several of Montana's licensed guides and private individuals.

This study was conducted by the Wildlife Restoration Division of the Montana Fish and Game Department under the supervision of Robert F. Cooney, Director. Field work was conducted by Merle Rognrud and Robert Casebeer with Frank Lancaster and Joe Gaab assisting part time. Plans and study outline were prepared in conjunction with Robert Casebeer who was also field photographer.

Photographic prints and maps were made by Hector J. LaCasse.

This report has been prepared and submitted by Merle Rognrud.

Mountain Goat Habitat in the Flathead Alps, Montana. This range adjoins the Continental Divide on the left at Junction Mountain.

A PRELIMINARY INVESTIGATION OF MOUNTAIN GOATS IN THE CONTINENTAL UNIT

INTRODUCTION

1. Location and Description of Investigation Area

The Flathead-Sun River, or Continental big game management unit, comprises a vast mountainous area of approximately two and one-half million acres in northwestern Montana. Bordering Glacier National Park on the south, this unit includes the Flathead Wilderness Area and Sun River Game Preserve. West of the Continental Divide, drainage is by the Middle and South Forks of the Flathead River; while east of the Divide the Teton and Sun Rivers are the principal drainages.

Topography of the continental unit is varied but generally mountainous with elevations from approximately 3000 ft. on the lower South Fork River Valley to the 9255 ft. Swan Peak. Most mountain peaks are 7000-8500 ft. in elevation. The Flathead drainage is rough to rolling with many cliffs, rocky outcroppings and high windswept ridges. The Sun River side of the Continental Divide is characterized largely by numerous reefs of an unusual geologic formation.

Climate is also locally variable in this area. During the summer, days are warm to hot, but with cooler nights. Summer rainfall is light, mostly in the form of local thunder storms until general fall rains begin in September. Usually permanent snow falls in October and November, increasing rapidly in depth with elevation and remaining

until April and May. In the spring, rains usually continue through June, but snow makes up a great part of the approximate 18 inches annual precipitation.

Vegetation is largely timber on the Flathead and Sun River drainages, though the latter has frequent open grassland areas. Douglas Fir, Englemann Spruce, Western Larch are dominant tree species in timbered stands at the lower elevations with some yellow pine sites and several other coniferous species. Lodgepole pine occurs often in vast stands on reproducing burns. At higher elevations and on the Sun River reefs, limber pine, whitebark pine, alpine fir and Englemann spruce are dominant, often with scattered, dwarfed scrubby growth. A ground cover of shrubs, herbs and grasses occur in the timbered types and on the timberline slopes. Some local sites are barren of any vegetation.

2. Distribution of Mountain Goats

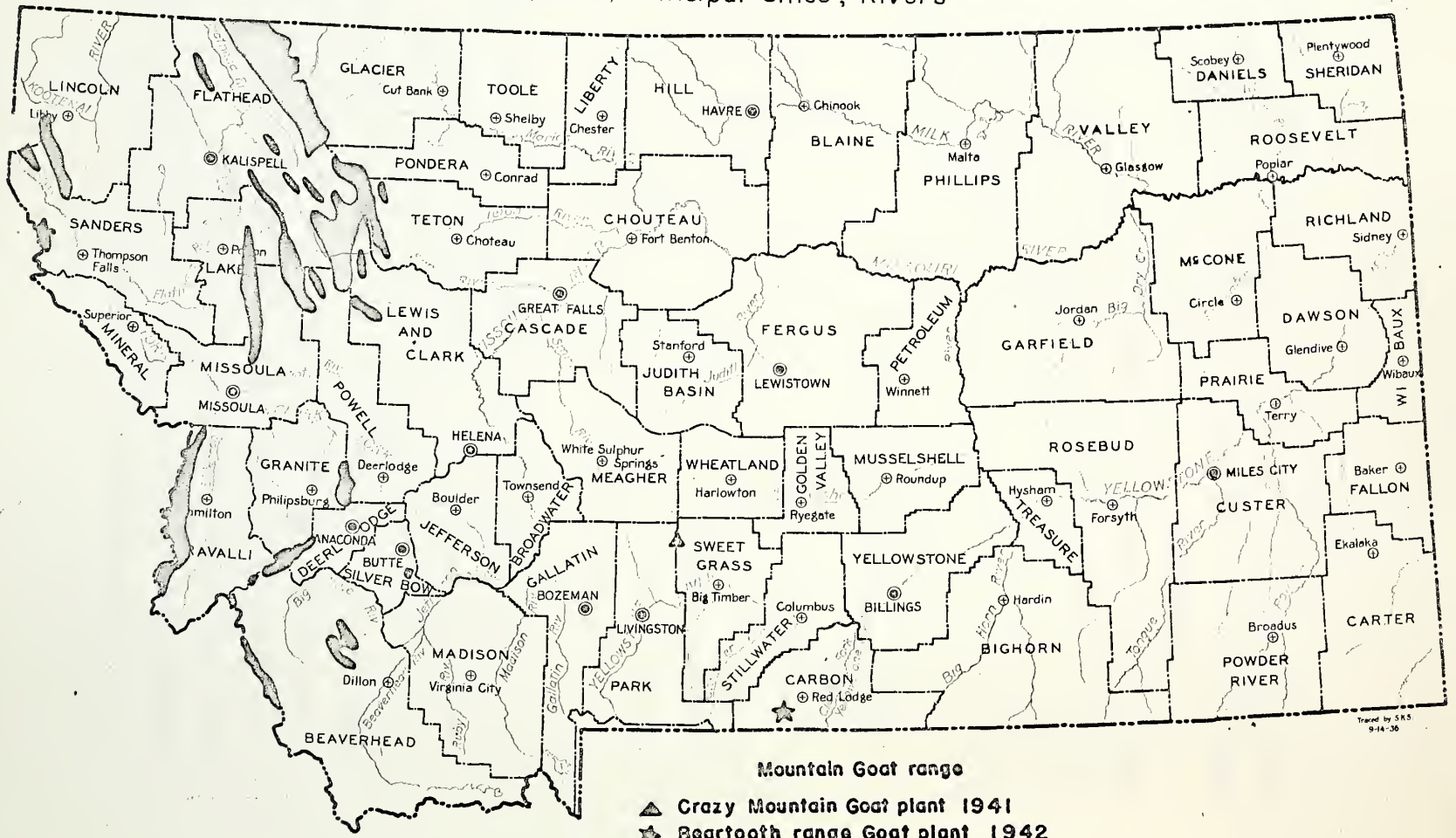
In North America the Mountain goat is found native to the Rocky Mountains and west coast ranges from Alaska south into Washington, Idaho and Montana. Apparently Mountain goat range centers in British Columbia with the mentioned extensions into the United States and Alaska.

In Montana (see Map I) its range is the mountainous western section largely along the continental divide or stringers of mountains connected to the divide. Introduction to new range by trapping and transplanting recently in Montana has been in the Crazy Mountains of Sweetgrass county and the Beartooth Range in Carbon county, the latter

MAP I

MONTANA.

Counties, Principal Cities, Rivers



group reportedly extending now into Wyoming. In South Dakota several mountain goats were accidentally released in the Black Hills during 1924 and have at present become an established herd.

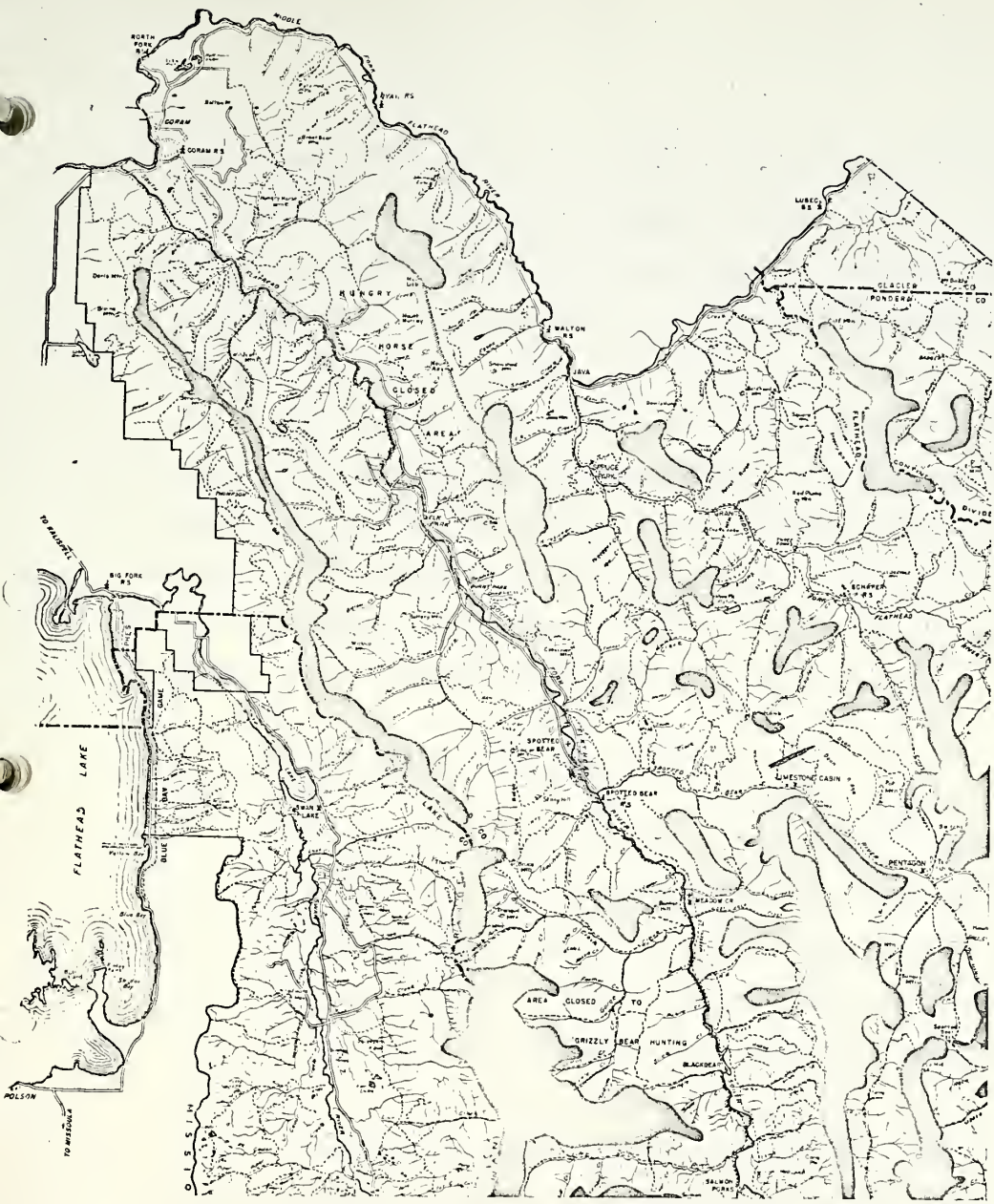
Mountain goat habitat (see picture 1) is usually associated with the roughest, most precipitous mountain ranges from the timberline or Hudsonian life zone to peaks above timberline in the Artic-alpine zone. Frequently goats have been observed in timber and burns at lower elevations but seldom far from rock slides, broken cliffs or cliff ledges except when traveling between mountain ranges or visiting licks.

Generally in the Flathead-Sun River area goats range in the most rugged, rocky, cliff and reef type country from mountain peaks to timberline; in hanging valleys, along steep slopes and the extensive cliff walls of the continental divide. See Map II for Mountain goat range in the Continental Unit.

3. History of Mountain Goat Populations

Records indicate Mountain goats are occupying practically the same range today as fifty years ago, and changes in population have likewise not been extensive. The nature of goat habitat has kept reduction by hunting to a minimum and civilization has not yet greatly disturbed the high rugged home of mountain goats.

Available census statistics from records dating back to 1919 indicate annual variations of up to 500 head in a goat herd on a given area. These variations are not concurrent with known severe winters,


NORTH FORK R.S.
GORAM
GORAM R.S.
MIDDLE
FORK
FLATHEAD
RIVER
KALISPELL R.S.
HUNGRY
HORSE
CLOSED
AREA
WALTON R.S.
JAVA
LUBEC R.S.
GLACIER
PONDERA
CO.
DIVIDE
SCHAFER R.S.
FLATHEAD
TO KALISPELL
BIG FORK R.S.
FLATHEAD LAKE
BLUE BAY
SPOTTED BEAR
SPOTTED BEAR R.S.
LIMESTONE CABIN
PENTAGON
MEADOW CR.
AREA CLOSED TO GRIZZLY BEAR HUNTING
BLACK BEAR
SALMON FOREST
POLSON
TO MISSOULA
OLSON

not related to hunting, and do not occur during the same years even on adjacent lands. Since game management was new during the early part of this century and mountain goats even more remote for observation than today, it is probable that more recent census data are most accurate.

Montana, according to Seton from a Forestry Bureau census in 1922, had 6,023 mountain goats (including Glacier National Park). In 1945 the census for mountain goats from the Montana Fish and Game Commission cumulative record was 5,182 head. Some annual variation in Montana goat herd populations must occur although probably not great enough for determination by present rough census estimates.

4. Purpose and Scope of Investigation

Of Montana's big game animals, the mountain goat is probably least understood. Its local distribution especially in more remote areas, seasonal range use, food habits, life history habits and requirements, population trends, relationships to other big game, possible predation, and other factors necessary for a management plan have not been determined.

Accordingly a preliminary investigation was made by the Wildlife Restoration Division of the Montana Fish and Game Commission during July, August and September of 1946. The area selected for this work was the Continental Unit, because the largest Montana goat herd is found in that vast country and many conditions would probably be quite typical of mountain goats in Montana. Any developed management

techniques could later be applied with necessary modifications on other goat herds.

The entire Unit being too large for a single summer coverage, observational travel was routed through the area formerly open to Mountain goat hunting. A goat census was the primary objective of this work for immediate determination of the herd status and possibilities of an open hunting season in 1947. However, all life history and related information were recorded for identification of management problems and a better understanding of this increasingly important big game animal. During the investigation, a current check was made on other big game and game bird species.

THE 1946 SUMMER INVESTIGATION

1. PROCEDURE

A mountain goat investigation was new in Montana and field methods could only be outlined; the details of procedure to be later worked out from experience. In order that the workers could have a background of available information, a trip was made around the area, interviewing U. S. Forest Service personnel, Glacier National Park Rangers, licensed guides and private individuals. Historical data were obtained on goat populations and hunting take. Known local goat herds were recorded as were location of licks. Some life history information and reports of best methods for observation were also obtained.

Crew: The three-man crew designated by the Wildlife Restoration Division to conduct this work was: Merle Rognrud, Robert Casebeer,

Overnight camp from back packs on the lower edge of goat habitat. Continental Divide near Lick Creek Pass.

Field equipment included horses and camping gear. The outfit is moving under Cliff Mountain.

and Frank Lancaster. (Joe Gaab assumed Lancaster's position on September 20th when Lancaster transferred to Eastern Montana).

Equipment: Equipment consisted of three saddle and two pack horses with necessary riding and packing gear. Camping gear for three men included: one 8x8 pyramid tent; one nylon army 2-man pup tent; cooking uhensils, down sleeping bags, axe and shovel. Food was packed in the Sun River area but was obtained from the U. S. Forest Service on the Flathead Forest. On both areas horse pasture and grain were obtained from the Forest Service and Forest Service cabins used when possible.

Other field equipment included: binoculars; 1/2" scale contour maps of the area, mounted on cloth; notebooks; packsacks and personal duffel.

Route of Travel: Travel was routed generally north along the Continental Divide from Scapegoat Mountain to Spotted Bear R. S. July 8-28; then south from Spotted Bear R. S. east of the South Fork of the Flathead River to Danaher R. S. August 8-26; then north from Danaher R. S. To Spotted Bear R. S. west of the South Fork of the Flathead River September 6-25. Map III shows summer investigation travel route by horse and on foot with camp sites also indicated.

An itinerary of travel was necessary for each month but changed according to local conditions of trails, weather, and in some cases the extreme difficulty found in covering the terrain.

Following is a table of miles traveled by the field crew on horse and afoot from July to September, 1946.

MONTANA

FISH AND GAME DEPARTMENT

Hunter Map

SUN RIVER-FLATHEAD

LEGEND

- County Boundary
- Main Roads
- County Seat
- Dist. Ranger Sta.
- Towns
- Game Preserves
- U.S.F.S. Cabins
- Landing Fields
- Closed to the hunting of Grizzly Bear.

- Foot travel
- Horseback
- Camp or USFS cabin site

	Rognrud		Casebeer		Lancaster		Gaab	
	foot	horse	foot	horse	foot	horse	foot	horse
July	122	190	111	204	*	256	*	
Aug.	82	179	105	167		244		
Sept.	84	206	104	344		250		120
Totals	288	575	320	615		750		120

	Observation Foot Miles (Not duplicated)	Miles Traveled (One horse)
July	133	256
Aug.	122	244
Sept.	188	370
Totals	443	870

*(Packing for crew hence no foot travel).

Methods of Field Observation: Local topography was the main factor in determining methods of mountain goat observation. Factors considered in routing observational travel through mountain goat country were: distance from the nearest camp, presence or absence of trails and degree of trail maintenance, extent of inaccessible cliff barriers, windfalls and timber reproduction in burned areas, steepness of adjacent mountains and ridges for approach and descent and desirable time to be allotted in covering the area. Familiarity with the area to be covered was, therefore, desirable.

Since travel was usually progressive during the census and camps were made each night (whether from back pack, pack string, or

U.S.F.S. cabin), plans for local coverage included: food, shelter, distribution of pack between observers and, if separated during the day, designation of meeting places at night for combining camp equipment. The cooperation of crew members in camping, keeping schedules and various other ways made a comprehensive survey of the area possible.

The objective in routing travel was to place the observer in a position commanding a wide view of mountain goat habitat in later afternoon. This was found to be especially desirable after a storm, when goats are most active. The observations were best made across a canyon, not too distant, and with the observers' back to the sun. Binoculars were essential and used systematically in covering the area for mountain goats.

Notes were best recorded in the field at the time of observation. The form used during this investigation for recording data on each single or group of mountain goat is given below. (The back of each sheet used for remarks).

MOUNTAIN GOAT STUDY
DATA SHEET

Date _____ :
Weather: Sky _____ Ppt. _____ Wind _____ :
Locality _____ :
Alt. _____ Exp. _____ Slope _____ :
Cover type _____ :
Animals observed: (actual count) _____ :

Hour	Adults	M	F	Yrlg.	Kid	Uncl.	Total

Estimated additional _____ :
Total _____ :

MOUNTAIN GOAT STUDY
DATA SHEET (cont'd)

Activity _____

_____

Physical condition _____

_____

Foods & Feeding habits: No feeding _____
Types of feeds taken _____
Species taken _____
Parts taken _____
Distance to water _____
Distance from observer _____

In addition to the above notes, a daily notebook was kept including: date, weather, route of travel, miles traveled on foot or horseback, game seen (other than mountain goats), predatory animals, furbearers seen, bear track measurements, food and feeding habits (excepting mountain goats), condition of game, range conditions, game movements and migrations and licks (artificial or natural).

During July Robert Casebeer and Merle Rognrud traveled together on foot through mountain goat habitat. Camping from back packs was never more than two nights out, one night camps being most common. Frank Lancaster, who traveled constantly with the horses, could often not be met by one day of foot travel (6-19 miles).

The fieldmen, working together in July for training, developed similar observational techniques and, with constant exchange of ideas, problems were identified and best methods for accomplishing the work were developed. In August much observation was male separately and during September each observer traveled mountain goat habitat alone in order to census the designated area.

Because mountain goats could not always be seen when a given area was covered, or it was likely only a portion of the local group was counted, some method of estimating total numbers had to be used.

First, information on the locality was obtained, particularly the largest number of goats seen in the past at one time. Then in the field the locality was examined to determine the amount of goat habitat present and if the locality was isolated or related to neighboring known goat populations. If goats were not seen, tracks, droppings and hair indicated current use of the area and probable numbers. If goats were seen, an estimate could be made. For example; if three adult males were seen and the sex ratio was assumed to be 50-50, there would quite probably be three females in the area (if this locality has year around habitat and goats seen were not stragglers or accidental in the area). Then two of these females should each have young and adding one possible yearling, which would make a nine goat estimate for the locality. This method was thoroughly checked and seemed most reasonable for estimating some local goat herds.

When time is limited and the observer cannot remain in a locality until he is satisfied all goats have been seen, the above suggestions, modified for local conditions, may help to arrive at an estimate figure. Field experience indicates the tendency is to underestimate goat populations.

Incidentally, it is often possible in the field to approach within close range of goats. This is especially true when the approach

is made along a contour or from above the animal. Following is a table indicating distance goats were seen from the observer during the investigation.

MOUNTAIN GOAT SEEN - DISTANCE FROM OBSERVER

Distance (Fraction Mile)	Number Mountain Goats Seen
0-1/8	92
1/8	2
1/4	59
1/2	58
3/4	18
1	56
1-1/2	25
2	11
2-1/2	7
3-3½	11
	337

2. THE MOUNTAIN GOAT

Classification:

The Mountain Goat is a mammal belonging to the order Artiodactyla (Ungulata, by some authorities) which are even toed hooved forms as bison, cattle, deer, antelope, sheep and goats. Its family Bovidae is characterized by both sexes (usually) having permanent, hollow horns growing larger each year on bony cores arising from the skull frontal bones. The sub-family, Rupicaprinae, in which the mountain goat is placed, also includes the goat-antelope of Asia and the European Chamois. The form of Oreamnos americanus missoulae (Allen) Montana Mountain Goat, smaller than typical americanus with a narrower skull, is found in Montana and Idaho.

Physical Description:

A general description of the genus from Anthony & Seton is: medium sized, with short, erect horns curved slightly backward; pelage long and white with wooly underfur; short beard on chin; tail short; teats, four.

Size:

At present the Montana Fish & Game Department have no measurement records of adult, yearling or kid mountain goats. However, it is hoped that during future field operations these important data will be recorded.

Seton gives the following genus measurements for a male adult; (Female 10 to 20 percent smaller).

Total Length	60-70 in.
Tail Vertebrae	6-8 in.
Hind foot	13-14½ in.
Height at Shoulder -	39-41 in.

Because the Montana form is smallest, measurements would probably be less than those recorded by Seton, Anthony and the Mountain Goat Study Progress report of Washington State Game Department.

Weight:

During the years 1941, '42, '43, '45 and '46, the Wildlife Restoration Division of Montana Fish & Game Department have trapped and transplanted 48 mountain goat. Of this total, weight in pounds were recorded for 33 head from Teton county which is summarized as follows:

Sex	Age	Number Trapped	Largest	Smallest	Average
Male	Adult	6	170	102	124.3
Female	"	8	158	104	133.7
Male	Yearling	5	90	42	59.4
Female	"	14	88	37	57.8
Male Kid	(Days	-	-	-	-
Female Kid	(Weeks	-	-	-	-
	(Months				

Seton mentions weight varying from 100-300 pounds for adult goats. Kids in Washington a few days after birth weighed: male - 8 lbs; female - 6 lb., 5 oz. The need for size and weight data in Montana cannot be over emphasized.

Pelage:

The coat is white with long hairs interspersed in thick wooly underfur, giving a rather shaggy appearance even when prime in the fall and winter. Buttocks are frequently stained yellowish.

In the spring and early summer (May-July) when molting occurs, the coat appears ragged and frequently very dirty, until the new even white hairs are evident after the animal has molted. Molting is first complete about the face and neck progressing posteriorly, since matts of ragged hair were last observed about the buttocks and rear quarters in late July 1946. The first goat observed completely molted was a male in excellent condition July 17, 1946. Goats in the Continental Unit appeared to complete molting by the latter part of July. The new pelage frequently has a yellowish tinge. This was also apparent from limited winter observations in January 1947.

Kids are white but Seton mentioned the pelage having dark hairs

especially dorsally so there is an apparent dark mane. These numerous dark hairs were noted on kids at Canyon Creek, Montana during August, 1946.

If approximate shedding dates are the same each year, Washington mountain goats may complete molting 15 days earlier than Montana animals.

Horns

Both sexes bear pointed slightly backward curved horns, black in color. The male horns are usually longer, larger in circumference and with a more pronounced backward curve than the female. Horn growth is continuous and especially rapid in kids (Washington reports $2\frac{1}{2}$" in first $2\frac{1}{2}$ months), but slower after this first period into maturity and old age. A female kid trapped in August at Canyon Creek, Montana had horns hardly noticeable - merely protruding through the wool and less than one inch long. In older adults, ridges are found on the horns which have apparently some relation to age.

From North America Big Game Official Measurement records, the following statistics are given for goats taken in Montana.

	Length of Front Curve	Circum. at Base	Tip to Tip	Greatest Spread	Sex	Locality	Year
	11-1/8	4-3/4	6-1/2	6-5/8	F	Montana	1896
	10-1/4	5-3/4	6-3/4	7	M	Montana	1903
Record)	12-1/2	5-1/2	6-1/2	7	F	British Col.	Prior 1916

During this investigation no horn measurements were made and horn growth in kids not determined, though such information would be

desirable in records of future work.

Teeth:

Mountain goats have the following dentition: Incisors, $\frac{0}{4}$; Canines, $\frac{0}{0}$; Premolars, $\frac{3}{3}$; Molars, $\frac{3}{3}$; = 32. No observations have been made on teeth wear in relation to age, physical condition, etc. in Montana. Washington reported an old female without incisors; the premolars and molars were worn smooth almost to the gums.

Ears:

Not large, approximately the same size in both sexes and about five inches long in Washington goats.

Tail:

Also not large, about six inches long in Washington goats, covered with long hair except the ventral surface which is naked from the base to near the tip. The tail was observed to be frequently held erect when a goat was alarmed.

Tracks:

The mountain goat track is distinguished by its approximate same width for about 3/4 of the length, then tapering rather abruptly to a blunt point. (See picture page 24).

A series of track measurements for both sexes and by age classes would be a desirable record in Montana. One adult track measured: 3-1/8"x2-3/4".

Glands:

Behind the horns are two glands which are larger and especially active in males during the rut. During September one adult

male was observed apparently rubbing these glands on the fruiting stalks of Bear Grass and other vegetation in the vicinity.

Feces:

Often nearly triangular in shape at least usually pointed on one end but reported variable with seasonal food habits.

Voice:

No sounds were made by goats observed during this investigation. However, various sound are known to be made by both adults and kids. Probably the bleat of kids would be the sound most frequently heard by continual observation of a local goat herd.

Senses:

Sight of mountain goats is apparently comparable to elk and deer. Observations tended to indicate a goat's inability to distinguish the stationary observer at close range from other landscape objects. Also at greater distances movement by the observer was usually not noticed.

Hearing is also apparently not important to mountain goats for sensing danger. Their ability to detect various unusual sounds would be difficult to determine, but at closer ranges a whistle will attract attention while a gun shot usually will not disturb them, if the sound source is not seen.

Smell is a quite well developed sense in mountain goats. Observations indicated that although the observer was unseen and not heard, a goat would frequently enough become alarmed by scent at closer ranges. On many occasions, even when movement was detected, not until

the wind carried scent to the goat would it depart.

It seems questionable whether the reaction to danger by sight, hearing or smell would be indicative of the degree of development of those senses when the nature of mountain goat habitat makes it a rather unwary animal, seldom disturbed, especially in remote areas.

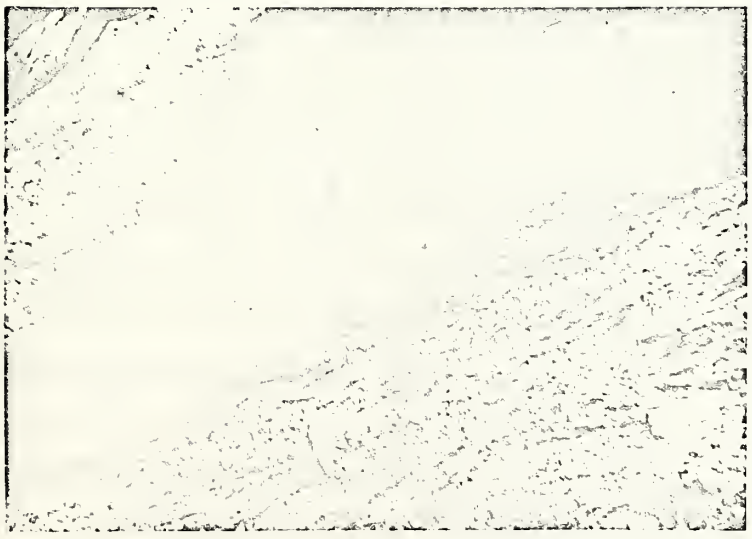
Mannerisms:

Gait of the mountain goat is usually an unhurried ambling walk when not alarmed. When alarmed the goat will lope rather stiffly with short hops across openings, slowing to a quick, sure trot with rougher going and walking deliberately, unhurriedly over difficult terrain.

The escape route seems predetermined - the distance covered being with a gait suitable to the terrain. Often trotting and loping are alternated with pauses to look back. As the distance from danger is increased, pauses are more frequent and walking resumed often until safety on some high ledge or protecting rock is reached where the goat will hide, if possible, or await developments. In escaping goats frequently travel along the contour and are possibly aware of their white coloration, since seeking safety in shadow of rocks and ledges was observed.

Posture of mountain goat is unique for horned animals because it reportedly assumes the position of sitting on its haunches, usually when curious. Standing, the shoulder hump is more pronounced in males. The adeptness of mountain goat at climbing is general knowledge. Its ability to travel cliffs and difficult terrain is

Goats are adept mountain climbers. The goat shown is negotiating cliffs in the Flathead Alps.



illustrated by pictures on page 19. Here the sitting position was momentarily assumed to aid in negotiating the steep incline.

3. FINDINGS

Distribution and Occurrence:

General: In addition to local geographical distribution (see Map II), the distribution of mountain goats by elevation, exposure, slope, cover-type and distance to water were recorded. From these data some tendencies of summer distribution are noted.

Elevation: In the Continental Unit results of elevation observations are indicated in Table I below.

TABLE I

MOUNTAIN GOAT DISTRIBUTION BY ELEVATION
JULY-SEPTEMBER, 1946

Elevation in Feet	Adult not sexed	Male	Female	Yrlg.	Kid	Unkn.	Totals
5000-5750	1		1		1		3
5750-6250		2					2
6250-6750		3		3			6
6750-7250	36	17	13	3	14	11	94
7250-7750	35	25	14	8	12	4	98
7750-8250	46	13	25	22	19	5	130
8250-8750	4						4
TOTALS	122	60	53	36	46	20	337

The goats seen at different elevations were tabulated by age and sex classes. Possible changes in elevational distribution during the

summer months were not worked out. Changes in elevation between seasons probably occur and any existing pattern would be a desirable record in future work.

From the table, it may be seen that during the summer most goats were found at elevations 6750-8250 ft. Of this total more than one third ranged 7750-8250 ft. which elevations are usually from the artic-alpine life zone down to timberline (in the Continental Unit). During this season males tended to range more at lower elevations than female, yearling and kid groups, which were seen most often at highest elevations, particularly during July.

Exposure: Mountain goat distribution by exposure during the summer is probably the least significant of results from field observations. Goats seemed to occur locally where broken cliffs, rocky walls and other features of the terrain were present regardless of exposure. In the area under observation goat habitat largely has eastern exposures because of topography. It is, therefore, difficult to weigh the significance of exposure in mountain goat seasonal distribution.

Table II below indicates by age and sex classes the goats seen during each month and the total for the season in relation to exposure. During July and September on E and SE mountain exposures goats were most frequently observed. In August, more goats were seen on NE and W exposures, but also a more general distribution on all exposures occurred. For the season most goats were seen on eastern exposures.

Males were most frequently seen on NE and E exposures; females and kids on E, SE, S exposures; yearlings NE, E, SE exposures.

TABLE II

MOUNTAIN GOAT DISTRIBUTION BY EXPOSURE

A. JULY

Age Class	EXPOSURE								
	N	NE	E	SE	S	SW	W	NW	TOTALS
Adult Not Sexed	5	4	9	15	3	7	8	1	48
Male	5		3	1		1	2		12
Female			7	7	1	4	2	1	22
Yearling	1	3	4	6		4	1		19
Kid			5	7	1	4	2	1	20
Uncl.			2	11	1				14
TOTALS	9	7	30	45	6	20	15	3	135

B. AUGUST

Age Class	EXPOSURE								
	N	NE	E	SE	S	SW	W	NW	TOTALS
Adult Not Sexed	5	8	4	4	2	5	6	4	38
Male		5	4	2	2	2	5	1	21
Female		3			4	4	4		15
Yearling	1	4			2		1		8
Kid		2			4	4	3		13
Uncl.							1		1
TOTALS	6	22	8	6	14	15	20	5	96

TABLE II (Cont'd)

C. SEPTEMBER EXPOSURE

Age Class	N	NE	E	SE	S	SW	W	NW	TOTALS
Adult Not Sexed	3	4	10	9			4	6	36
Male	3	7	9	3	1		1	3	27
Female	1	1	4	5	2		1	2	16
Yearling		1	3	3			1	1	9
Kid	1		4	4	2		1	1	13
Uncl.		3	2						5
TOTALS	8	16	32	24	5		8	13	106

D. JULY-SEPTEMBER SEASON EXPOSURE

Age Class	N	NE	E	SE	S	SW	W	NW	TOTALS
Adult Not Sexed	11	16	23	26	5	13	18	11	122
Male	8	13	16	6	3	3	6	4	60
Female	1	4	11	12	7	8	7	3	53
Yearling	2	8	7	9	2	4	3	1	36
Kid	1	2	9	11	7	8	6	2	46
Uncl.		3	4	11	1		1		20
TOTALS	23	45	70	75	25	35	45	21	337

Mountain goat tracks are distinguished by the approximate same width for 3/4 their length and the blunt toes.

This cave on the north exposure of Flatiron Mountain had been used by goats during past seasons.

Slope: The numbers of goat seen on each of the various degrees of slope is shown in Table III below.

TABLE III

MOUNTAIN GOAT DISTRIBUTION BY SLOPE
JULY-SEPT. 1946

Level	Slight	Moderate	Steep	Cliff	Total
8	17	94	97	121	337

These results indicate goats frequent the roughest mountain country. Even those observed on level or slight slopes were in the vicinity of cliffs. The moderate and steep slopes were frequently broken cliffs or slides at the base of cliffs. That summering mountain goats are distributed along cliffs or in the vicinity of cliffs seems apparent from the above observations.

Cover Type:

TABLE IV

MOUNTAIN GOAT DISTRIBUTION BY COVER TYPE

Timber	Alpine Meadow browse	Cliff ledge broken cliff browse, etc.	Slide Rock	Barren	Total
52	130	80	55	20	337

The local variation of vegetation in the Continental Unit at elevations which goats are found made it difficult to determine the class of cover type for each animal seen. However, the five general

classes used seemed most distinguishable for survey purposes and would indicate some tendency in goat foraging habits.

A plant check list of species found in various local sites for each of the above categories would include plants taken by mountain goat during the summer. Since most goats were observed feeding in alpine meadows, these areas would also have plants most frequently taken during the summer.

Distance to Water: Although it was not determined whether availability of water would influence mountain goat distribution, the following table indicates most goats were not more than one-half a mile from water.

TABLE V

MOUNTAIN GOAT SEEN - DISTANCE TO WATER

Distance (Fraction Mile)	Number Mountain Goats
0-1/8	13
1/8	33
1/4	98
1/2	133
3/4	28
1-1/4	12
TOTAL	337

Life History Habits:

During the summer, notes on goat activity, behavior, etc.

which might indicate life history habits were recorded. This information was not voluminous, but is included in this life history section under the divisions: General Habits, Food Habits, Breeding Habits and Reproduction. Available reference material has been used especially in the Food Habits, Breeding Habits and Reproduction sections in order that some information might be available in this report on goat life history and habits.

General Habits:

Habitat Requirements:

Cliffs and rough, high steep country at elevations generally above timberline with alpine meadows, basins, slides, etc. is the habitat most goats frequent during the summer. At other seasons of the year different conditions may exist.

Water Requirements:

The nature of goat habitat with springs, melting snowbanks and lakes makes water available almost everywhere. However, later in the summer watering might require more travel or even shifting of habitat locally by goats. The latter could not be determined this summer but few goats were seen more than one half a mile from water.

Daily Movement and Activity:

Daily activity of a mountain goat consists largely of alternating periods of feeding and bedding down. Either period may occur at any hour of the day. However, later afternoon and especially evening hours are used mostly in feeding. (See Table VI below).

Daily changes in elevation during feeding hours, moving up

in morning hours and down in afternoon, are reported by Bailey and a tendency to work up in afternoon and evening by Washington. In some instances this tendency to move up in feeding was noted, but was not general in all localities. A feeding pattern does, however, seem to exist. This often begins from a cliff crest and moves along the adjacent open slope, often on a contour, along a cliff ledge or in basins and slides below the cliffs. This general routine seems to be repeated daily in the same general area for days to weeks. Daily summer range is usually small, apparently only large enough to satisfy wants of food, water, shade and shelter.

After feeding, goats bed down in the shade if on a hot day, or in the sun on cooler days. Traveling and climbing are daily activities necessary between feeding areas and the bed, or during local shifting of range. Some time is spent merely standing or loafing and, depending on the season, either at licks or dusting spots. Goats do travel and carry on other activity especially on moonlight nights but the degree was not determined.

TABLE VI

HOUR OF OBSERVATION - MOUNTAIN GOAT ACTIVITY

Hour	Bedded	Traveling (Climbing)	Feeding	Loafing	Other
Daylight-9 A.M.	(14*) 5	9	(2*) 5		(1*)-at lick
9 A.M.-12:00	5	19	31		1 - dusting
12:00-4 P.M.	16	24	72	2	
4 P.M.-Dark	23	47	75	2	1 - watering
TOTALS	49	99	183	4	2

*Seen by Aerial Check: July 20, 1946

From the data on Table VI most goats were seen feeding; approximately half as many were seen traveling; and half the number of traveling goats were seen bedded down. This table also seems to indicate the difficulty of seeing goats bedded down. Any possible differences in daily activity by groups or the sex and age classes were not worked out.

Seasonal Movement:

Mountain goats wander considerably between ranges according to Bailey; and Washington mentions migrations between summer and winter ranges as does the 1942 Bitterroot Game Study in Montana.

During the spring, goats have been seen at least six miles from any known local range at licks. Shed hair and tracks indicate widespread movement by goats scrambling for mineral at this season. Travel is often along trails, or ridge tops in heavy timber, miles from cliffs, indicating that a goat may be found in a wide diversity of habitat at this season of the year.

In summer, goats apparently shift ranges to a certain extent for undetermined reasons. A group known to frequent a given locality suddenly will disappear. Whether this is a shift in elevation or to an adjacent mountain is not yet understood.

The fall breeding seasons seems to be another season of movement and shifting of groups. In the Black Hills there is a movement to lower elevations. In the Continental Unit there is probably some shift between mountains because goats are reported seen in localities not frequented in summer, or at least not in large numbers.

Movements to winter ranges have not been determined. Whether there is a shift in elevation, exposure or to adjacent mountains, etc. would be desirable information. Goats in winter seek high windswept ridges and have been seen along cliffs with N., W. and S. exposures on or within a few miles of known summer range.

It seems quite definite that goats are not permanent year around residents on some mountains. Their seasonal occurrence in some localities and relations to adjacent areas should be worked out to determine movements for developing a management plan. In the Black Hills the herd ranges in an area of 20 sq. miles. The transplanted group, now a small herd in the Crazy Mountains, Montana, range is an area approximately 5 miles from point of release. Apparently the goat does not have a great mobility if habitat requirements are met locally. At the same time a traveling goat can cover a relatively long distance in a surprisingly short time. Some system for marking goats to determine movements would be desirable for a detailed study.

Flocking, Group Size:

Mountain goats are gregarious. The sex and age composition of herds seems to vary with the different seasons. Seton reports groups of 5-6 females and kids during the early summer, groups of 12 during later summer and large groups of 50-100 of both sexes in fall and winter. In the Black Hills, Harmon mentioned groups of 3 (female, yearling, kid) seen in early spring with smaller groups combined into larger herds, occasionally.

During the 1946 summer investigation largest herds were seen

during July; these groups were largely composed of females, kids and yearlings. At Red Buttes on the West Fork of the Sun River 40 head were seen and near Cliff Mountain two groups of 12 and 15 goats were observed. In July, August and September goats were also seen as singles, mostly males and an occasional yearling or female; twos, mostly female and kid with an occasional pair of males or male and yearling, or female and yearling; three, usually female, kid and yearling, once three males; four, usually female, kid and yearling group in various combinations. See Table VII below for frequency of observation on various group sizes.

A possible explanation of summer flocking habits as indicated by field work would be: In the spring after kids are traveling, family groups of females, kids and yearlings band together in herds of various sizes, tending to frequent a given locality. Ranging in the vicinity of this herd or at extremities of adjacent goat habitat single males, occasional yearlings or female-kid pairs are found. Later in the summer the central herd apparently breaks up and a shifting of range, elevation into timber or to adjacent mountains by the smaller groups seems to occur. In general this scattering effect seems to exist through September. It seems probable a group smaller than 5-6 would not be permanent residents on a given mountain.

Reports of larger goat herds during the fall in the Continental Unit probably indicate banding again for the breeding season. Goats have been seen as singles and small groups during winter months. In spring large groups have been seen at licks, but flocking behavior

Rapid kid growth and the adult pelage condition is indicated by this goat group during late summer on Crimson Peak.

One August morning a goat was observed dusting at this site in the Flathead Alps.

is generally not well known.

TABLE VII

MOUNTAIN GOAT GROUP SIZE
NUMBER OBSERVATIONS

Group Size	Number Observations	Number Goats
1	50	50
2	39	78
3	13	39
4	11	44
5	4	20
6	1	6
7	1	7
-	-	-
12	2	24
14	1	14
15	1	15
40	1	40
Totals	124	337

From these results approximately two thirds of seen mountain goats were in groups of five or less during the summer. The group size most frequently seen were 2-4 individuals, primarily females and kids. Comparing seen single goats (largely males) with other group observations does suggest female-kid groups were not seen in some localities. By observations on a single goat herd it would be possible to determine if summer movements follow any definite pattern.

Beds:

Goats were observed bedded at all hours of the day. The bedding site was usually on ledges, near the crest; or the base of cliffs. Droppings indicated consistent but not necessarily regular use of some sites. During hot, summer days beds were frequently in the

shade and in the sun on cooler days. Bedding was often not far from where the goat completed feeding.

The possible regular use of bed grounds by herds was not established. Kids were observed bedding immediately behind the female early in the summer. Goats have been observed to rise from a bed, paw, reverse directions and bed down again. Individuals of a group generally bed near one another.

Shelters, Caves:

Caves were found which had been used by goats during some season of the year (see picture page 24). Although goats apparently can stand severe cold, they have been observed to take shelter during storms on the lee side of cliffs, rocks or under a ledge. Hard rains seem to frequently cause goats to seek shelter.

Dusting:

Sites used for dusting by goats were occasionally found during the investigation. Dusting is possibly most frequent while shedding in the spring and early summer, but sites (see picture page 32) indicated use in August. One goat was observed dusting in August throwing dust over itself at irregular intervals with the front feet.

Sanitation:

Habits related to sanitation were not determined. Bed sites used repeatedly were filled with feces, indicating little sanitation about bedding.

Licks:

The craving for minerals by goats during the spring is

manifested by their travel to natural or artificial licks. Frequently goats have been seen at licks miles from familiar habitat and during this season may accidentally be found traveling strange localities. (Incidentally this travel to licks in unfamiliar habitat might be worth investigating for any relation to mortality in goat herds from possible accidents and predators.)

Natural licks used by goats are only partially known and are variable in site, size and probably in composition. Most frequent seems to be the type in blue shale formations. Artificial licks established from plane salting annually for elk by the Montana Fish & Game Department are also used by mountain goats. Following is a partial list of natural licks known to be used by goats, in the Continental Unit.

Garnet Peak
Little Salmon Creek (mouth)
Kid Mountain
Crimson Peak
Calf Creek (head)
Turtlehead Mountain (N. exposure)
Lost Jack Creek (head)
Cathedral Peak (head Mid Cr.)
Whitcomb Mountain
Bowl Mountain (Trail Cr.)
Bowl Creek (head)
Bruce Creek (N. side)
Moonlight Peak
Headley Reef
Cliff Mountain (artificial drop)
Harrison-Silvertip Creek (divide)

Food Habits:

General:

No food habit determinations were made during this investigation. The necessity of constant travel precluded goat food habit

observations. However, from references and reports some general habits will be mentioned.

From all information, seasonal plant use in species, parts taken, etc. is variable. (Washington goats used 34 species during spring and summer, 16 species in the winter). Browse species are apparently most frequently used and herbs, grasses, moss and lichens to a lesser degree, depending on the season.

In winter the availability of species would vary with snow conditions affecting selection and parts used. Harmon states in the Black Hills, goats during the winter used: moss and lichens 60%, Arctostaphylos 20%, Ponderosa pine browse 10%, miscellaneous 10%. Goats did some pawing for forage but most feeding was above snow level.

Spring and summer feeding habits in Montana from the 1942 Bitterroot study included: Browse: Ceanothus, Dogwood, Alder, Ninebark; Herb: Senecio; Grass: Mountain brome; Moss and lichens. During August 1946 the Montana goat trapping crew noted feeding on: Browse: Ribes, maple; Herb: Liliaceae, Aster; Ferns. Bailey in Glacier Park mentioned: Dwarf willow, Mountain grass, sedges, mountain sorrel and waterleaf (Phalecia) taken by mountain goats.

A detailed food habit study would be desirable for Montana mountain goats. Field observations on a single local herd would be necessary to determine food habits. When possible stomach samples would give important supplementary data. The food habit study would be a prerequisite for determination of the range carrying capacity for mountain goats.

Breeding Habits and Reproduction:

General:

Breeding habits of mountain goats are not clearly defined nor well understood particularly for the form in Montana. The need of field work in observing breeding season behavior is evident.

Rutting Season:

Dates: In Washington the rut occurs during November and December. For Montana an estimate would be November.

Mating: Washington reports goats are believed to be monogamous, as do a number of authorities. This does seem questionable because males were seldom seen with female and kid groups during the summer, and in the fall there were reported large bands of both sexes by Seton. Continental Unit hunting party reports suggest the breeding behavior of polygamous animals.

Minimum Breeding Age:

This, of course, has not been determined but is given as one and a half years, the first young being born when a female is two years old.

Gestation Period:

The gestation period for mountain goat is given as 170 days, or approximately six months.

Birth:

In Washington the earliest date of birth was set as May 10. First kids have been observed in Glacier Park June 15. It is probable most kids are born during May and early June.

Number of Young per Year:

Mountain goats usually have one kid per year but twins are occasional. Washington reports twins in 14% of females. No twins were seen during the investigation but an old female (8-9 years) was reported with twins August 1946 at Canyon Creek, Montana.

Growth of Kid:

Growth of the kid is rapid and in a month they are adept at traveling and climbing. At first kids are playful but were later seen foraging more. Reportedly kids take solid food when 5-6 weeks old. By fall kids are nearly spring yearling size with the horns noticeable.

A pregnant female in captivity would yield information on date of birth, growth of kid in size, weight, growth of horns, changes in pelage, teeth, duration of nursing period, etc. It is suggested two females taken by the spring trapping operations be kept under observation in pens near Helena in order that this information be collected.

Longevity, Senescence:

The life span of mountain goats has been reported as 10-12 years. Old age conditions as teeth wear, condition of pelt, etc. have not been determined.

Ecology of Mountain Goat:

Range Use:

In the Continental Unit, forage on goat summer range appeared plentiful. The wintering range capacity was estimated as 2550 units in 1944. Following the 1946 investigation the herd was estimated at

approximately 1715 head. The estimated availability of winter range does not suggest that wintering conditions would be critical for goats. Field investigations, especially during more severe winters or early spring following severe winters, could determine the winter effect on goats.

Relation to Other Big Game:

During summer months in some localities elk and mule deer were seen feeding on the high slopes also used by goats. Mule deer are not numerous and any elk competition for forage, if it does occur, would be local and for a short period of time.

In some Sun River areas mountain sheep and goats are found in the same general locality but inter-relationships are not known.

Predators:

No evidence of any predation was found during the investigation. Coyotes (most numerous predator) would be suggested as a possible predator, as would an occasional bear (Grizzly or Black) and possibly the Golden Eagle. It is suggested that predators do not take many goats and if predation does occur that early spring is the most probable period. U. S. Forest Service reported a Grizzly and goat seen feeding 75 yards apart. Reported also was a picture of an eagle carrying a kid, but this was not located.

Accidents:

Some goats are lost each year by avalanches, snow slides, falling rock and falls according to the Washington Report. No evidence of such accidents or crippled goats were seen during the 1946 field investigation.

Disease:

Internal parasites reportedly found in goats are flukes, tapeworms and roundworms. Ticks are found on goats and heavy infestations would tend to cause a weakened condition.

Mountain Goat Census:

General:

The summer investigation was generally routed through that section formerly open to mountain goat hunting in 1944. For an adequate goat census of the entire Continental Unit, three crews working separately would require most of one summer. Winter census work in much of the goat habitat would often be hazardous and impractical without elaborate preparations beforehand, and only then by experienced personnel.

The following estimated census for mountain goats is given by sub-units and locality for the entire Continental Unit. This material has been obtained from all available sources.

TABLE VIII

FLATHEAD-SUN RIVER UNIT
1946
Mountain Goat Census

Forest	Sub Unit	Locality	Estimated Numbers
Flathead	#1 Coram	Great Northern Mtn.	50
		Circus-Felix Pk.	20
		Six Mile-Doris Mtn.	10
		Three Eagle-Big Hawk	10
			90

TABLE VIII (Cont'd)

FLATHEAD-SUN RIVER UNIT
1946
Mountain Goat Census

Forest	Sub Unit	Locality	Estimated Numbers
Flathead	#2 Schafer	Circus, Baptiste, Red Sky Mtn.	30
		Forester-Bradley Mtn.	20
		Horseshoe, Twin, Hematite	20
		Elk Calf-Big Lodge Mtns.	60
		Scales, Capitol, Union Mtn.	20
		Argosy Mtn.	10
		Chain, Ringer, Trilobite, Pentagon	50
		Continental Divide	
		(Anglo Pt.-Teton Pass)	40
		(Devil Mtn.-Lubrant Pass)	75
			325
Flathead	#3 Spotted Bear		
		Six Mile-Thunderbolt Mtn.	10
		Gildert-Thunderbolt Mtns. Crevice Lakes	23
		Inspiration-Sleeve Mtns.	27
		Sunburst-Glen Lakes	19
		Parker Mtn.	8
		Deacon Mt.	6
		Condor Pk.	5
		Whitecomb Pk.	5
		Spotted Bear-Meadow Mtn.	40
		Sergeant Mt.-Whitestone Wall	16
		Silver Tip, Blanchard, Mid, Cathedral Mtns., Wall Cr. Cliffs	65
		Lone Butte, Pagoda, Turtlehead Mtns.	32
		Table-Bever Mtns.	22
		Bungalo Mtn.	7
			285
Lewis & Clark	#4 Teton	Chinese Wall	46
		Moose Cr. Ridge	35
		Ly Lake	5
		Three Sisters	30
		Lookout Mtn.	10
		Moonlight Pk.	20
		Signal Mtn.	15

TABLE VIII (Cont'd)

FLATHEAD-SUN RIVER UNIT
1946
Mountain Goat Census

Forest	Sub Unit	Locality	Estimated Numbers
Lewis & Clark	#4 Teton	Continental Divide & Stringers: (Wrong Ridge-Bushrat Pass)	
		a. Wrong Ridge	9 + 1
		b. Mt. Wright	20
		c. Mt. Drawyer	10
		d. Mt. Richmond	10
		e. Scarface Mtn.	10
		f. Spotted Eagle Mtn.	10
		g. Goat Mtn.	15
		h. Blackleaf Cr.	10
		i. Choteau Mtn.	15
		j. Old Baldy	10
		k. Rocky Mtn.	40
		l. S. F. Deep Creek	50
			350
Flathead	#5 Big Prairie	Flathead Alps	35
		Bullet Nose Mtn.	11
		Scarface Mtn.	18
		Apex, Pinnacle, Tower Mtns.	33 + 2
		Jumbo-Woodtick Mtn.	10
		Montana-Pyramid Mtn.	16
		Crimson-Lecks Mts.	29 + 1
		Pyne, Goat, County Mtns.	44 + 1
		Sunday Mtn.	11 + 2
		George-Hessler Lakes	36 + 4
		Gordon-Kid Mtns.	26
		Chair Mtn.	6
		Holland Lookout-Holland Pk.	31 + 1
		Albino-Sappho Creeks	35
		Gyp-Lena Mt.	16
		Garnet Pk.	12
		Charlotte Pk.	17 + 3
		Oreamun-Stadium Point 5% Feels	14 -
			440
Lewis & Clark	#6 Sun River	Continental Divide (Cliff Mt. to Holly Cr. Pass)	27 + 3
		Slategoat-Prairie Reef	15

TABLE VIII (Cont'd)

FLATHEAD-SUN RIVER UNIT
1946
Mountain Goat Census

Forest	Sub Unit	Locality	Estimated Numbers
Lewis & Clark	#6 Sun River	Castle Reef	18
		Red Buttes	41 + ?
		Minotaur Cr.	6
		Pearl, Acorn Basin, Headley Reef	25
		Sugarloaf Mtn.	7
		Triple Divide	33 + ?
		Scapegoat Mtn.	16
		Sawtooth Mtn.	12 + ?
		Red Slide Mtn.	5
		Cream Mtn.	30
		Steamboat Mtn.	30
			225

SUMMARY

Sub Unit	Mountain Goat Estimate
#1 Cowan	90
#2 Schafer	325
#3 Spotted Bear	285
#4 Teton	350
#5 Big Prairie	440
#6 Sun River	225
FLATHEAD-SUN RIVER UNIT	1715

The total 1946 estimate of 1715 goats is 330 greater than 1945 records for the Continental Unit. Annual herd increases for mountain goats are not well understood but 235 animals, or approximately 17 per cent of the 1945 estimate, would be an approximate 1946 herd increase. The remainder (95 head) is accounted for by error in census estimates during 1946 and 1945.

For comparison of this largest goat herd with other Montana

herds, the following statistics from the Big Game Cumulative Record are given by management units for 1944 and 1945.

MONTANA MOUNTAIN GOAT HERD ESTIMATES

Big Game Management Unit	1944	1945	1946
Flathead-Sun River (Continental Unit)	1390	1385	1470
Deer Lodge	990	850	835
Bitterroot	670	670	670
Swan-Blackfoot	375	390	315
Clarks Fork	225	265	285
Polson	200	200	200
Kalispell	160	180	100
Kootenai	175	125	175
Bridger-Crazy Mtn.	50	65	75
Big Hole-Lionida		30	30
Beartooth	15	17	6
Big Belt-Boulder	12	15	15
Blackfoot	10	6	6
Choteau		3	3
Glacier National Park	945	981	870
TOTAL MONTANA MOUNTAIN GOATS	5207	5182	5,058

Approximately 40 per cent of Montana mountain goats (excluding Glacier National Park) occur in the Continental Unit.

The census data given in Table IX below are for that portion of the Continental Unit covered during the 1946 investigation. This area includes Big Prairie, most of Spotted Bear and part of Schafer districts. The area conforms to the former boundaries described for the goat hunting season in 1944, and also includes the greater amount of goat habitat in the Continental Unit.

TABLE IX
MOUNTAIN GOAT CENSUS
July-September, 1946

Locality	Not Sexed	Adult Male	Fem.	Yrlg.	Kid	Uncl.	Total Seen	Est. Add.	Total Herd
Scapegoat Mtn*	2						2	14	16
Triple Divide*	1						1	12	13
Sugarloaf*	2						2	5	7
Headley Reef*							0	12	12
Pearl Basin*	2						2	11	13
Molly Cr. Pass*	1	4	2	1			8	8	16
Red Buttes*	13		5	5	7	11	41	0	41
Gladiator Mtn.	1						1	10	11
Cliff Mtn.)	5		10	5	8	3	31	3	34
Chinese Wall)	2	2		1			5	7	12
My Lake							0	5	5
Three Sisters	8	2	4	2	4		20	10	30
Table Mtn.	6			2			8	14	22
Pentagon Mtn.)							0	15	15
Trilobite Rg.)	4	1		3			8	3	11
Argosy Mtn.							0	10	10
Capitol Mtn.		3					3	5	8
Whitcomb Pk.							0	5	5
Beacon Mtn.	1		1		1		3	3	6
JULY TOTALS	48	12	22	19	20	14	135	152	287

(*Goats seen in these localities by aerial check July 26, 1946)
Scapegoat-0, Triple Divide-6, Sugarloaf-2, Headley Reef-0, Pearl Basin-1, Molly Creek Pass-0, Red Buttes-8.

Locality	Not Sexed	Adult Male	Fem.	Yrlg.	Kid	Uncl.	Total Seen	Est. Add.	Total Herd
Limestone Wall							0	7	7
Bungalo Mtn.		1					1	6	7
Wall Cr. Cliffs	1	1					2	7	9
Lone Butte	2						2	8	10
Silvertip Mtn.	6	2	2		2		12	18	30
Mid Mtn.	1	2	2		1		6	15	21
Sergeant Mtn.	1						1	8	9
Spotted Bear M.	4	4	4		4		16	5	21
Meadow Mtn.	1		1	2	1		5	14	19
Black Bear Mtn.		2					2	3	5
Pagoda Mtn.	5	5		1			11	11	22
Flathead Alps)	8	4		1		1	14	18	32
Flatiron Mtn.)							0	3	3
Bullet Nose Mtn	1		2	2	1		6	5	11
Scarface Mtn.							0	18	18
(Apex Mtn.	6						6	7	13
(Pinnacle-Tear M	2		4	2	4		12	8	20
AUGUST TOTALS	38	21	15	8	13	1	96	161	257

TABLE IX (Cont'd)

MOUNTAIN GOAT CENSUS
July-September, 1946

Locality	Not Sexed	Adult Male	Fem.	Yrlg.	Kid	Uncl.	Total Seen	Est. Add.	Total Herd
Jumbo-Wootick Mtn.							0	10	10
Monture-Pyramid Mtns	1	2					3	13	16
Leota-Crimson Pks	3	4	5	4	4		20	9	29
Puma Peak	6		1		1		8	2	10
Goat Mtn.	1	3	1		1		6	11	17
Count Mtn.	2		1		1		4	13	17
Sunday Mtn.	1						1	10	11
George-Hessler Lakes	4	4	1	1	1		11	25	36
Gordon-Kid Mtns.		6	3	2	1		12	14	26
Shaw Mtn.							0	6	6
Holland Peak	2	1				3	6	25	31
Albino-SapphoCr		1	1		1	2	5	30	35
Gyp Mountain		3					3	13	16
Garnet Peak							0	12	12
Charlotte Peak							0	17	17
Cremmus, Stadium Point, 56 Pks	4	1	1	1	1		8	36	44
Smith, Lion Cr. Pass	8	2	2	1	2		15	25	40
Sunburst-Clear L.	4						4	15	19
Alcove Mt.-Inspiration							0	27	27
Gildart-Crevice Lakes							0	23	23
SEPT. TOTALS	36	27	16	9	13	5	106	336	442
GRAND TOTALS	132	60	53	36	46	20	337	649	986

From the table 337 mountain goats were seen during the season. Estimates in addition to goats seen for each locality increased monthly especially during September, so that approximately one third of the estimated herd were actually seen. This is partially explained by progressive experience gained in judging goat populations. But also in September

a much greater area was censused requiring approximately twice the number of man days used in July (Fieldmen working entirely separately). In addition, the September work was in country having more goat habitat, including some of the largest local goat herds.

From Census Table IX sex was computed for adults seen, but not sexed in the field as given below in Table X.

TABLE X

SEEN MOUNTAIN GOAT ADULTS

	Sex-Field Determined	Percent	Adults-Sex Computed	Total Seen Adults
Male	60	53.1	65	125
Female	53	46.9	57	110
TOTALS	113	100.0	122	235

The estimated mountain goat herd composition by age classes was computed using age class percentages from seen goats as shown in Table XI.

TABLE XI

MOUNTAIN GOAT HERD COMPOSITION

	Seen and Classified	Estimated Additional	Total Herd	Percent
Adult	255	471	716	74.1
Yearling	56	74	110	11.4
Kid	46	94	140	14.5
TOTALS	317*	649*	966*	100.0

(*Totals do not include 20 seen mountain goats not classified by age).

From field data on goats seen during the investigation the following age, sex, herd relations were computed to indicate the 1946 population status.

Mountain Goat Age, Sex Relationships:

(a) Sex Ratio: (from sexed adult mountain goats).
.883 female : 1 male
1.132 male : 1 female

(b) Female-Yearling and Kid Ratio:
.698 yearling : 1 female
1.470 female : 1 yearling

.869 kid : 1 female
1.15 female : 1 kid

(c) Yearling-Kid Ratio:
.78 yearling : 1 kid
1.27 kid : 1 yearling

(d) Apparent 1946 herd increase
43 kids
271 male, female, yearling = 16.9%

(e) Mortality 1st Year (assuming 1945 kid crop same as 1946)
36 yearling
46 kid = 25%

It is believed the sex ratio would be possibly closer to 50-50 if a larger series of adults could have been sexed. The difficulty of determining sex in the field, especially at greater distances from the observer, is evident. To insure a minimum error when the sex of a mature goat seemed questionable, it was recorded as an adult, (not sexed). More males than females were seen, but this is not believed to be the exact condition because, in a number of cases, only males were seen in a given locality. It is suggested that female-kid groups were not seen because they were in timber or in hidden pockets

while the given locality was under observation.

The female, yearling and kid ratios indicate quite satisfactory relations between this group. A good percentage of females are bearing young; the apparent mortality between kid and yearling ages is not great; the annual herd increase is approximately normal for big game animals at 16.9%.

4. DISCUSSION

Status of Mountain Goat:

In Montana the status of goat herds, excepting the Continental Unit herd, have not been determined. From 1946 summer field observations, the Continental herd had a satisfactory kid crop. No evidence of mortality was found. Though decimation is known to occur, the causes whether winter kill, accidents, predation or disease could not be determined. It is suggested part of this herd reduction takes place in the age class up through one year, because 25% less yearlings than kids were seen and prior winters not being severe, the annual kid crop should not vary 25%.

Summer range for goats in the Continental Unit appeared plentiful. Although the herd is now increasing, it is not understood how a population increase is related to a possible increased distribution. Some localities with goat habitat do not have goats at all, only part time, or not in numbers the area appears able to carry. Again goats have been seen where least expected. Definitely more study is needed to understand year around goat behavior. Tracing seasonal activity of a single herd should yield at least part of this in-

To see mountain goat, observations were made from points commanding a good view. The Continental Divide is shown near Switchback Pass.

Most observational travel was on foot but occasionally by horse as above along the Chinese Wall.

formation.

The desirability of an open hunting season on mountain goats is questionable. Approximately 200 mountain goats were actually seen on the area formerly open to hunting. 137 goats were seen on adjacent areas, but the extent of movement to or from the hunting area is not known. Particularly are the movements and local herd concentrations not understood during fall months.

From herd estimates, it is reasonable to assume approximately 600 head may be present on the hunting area in the fall. From past kill records, take by hunting did not exceed 100 though the effect of recent increased hunting pressume would not be entirely predictable for goats. A take of 100 would be approximately 16-2/3 percent of the herd or the 1946 increase.

Below, from U. S. Forest Service records, is the goat kill by districts in the Continental Unit.

Year	Spotted Bear	Big Prairie	Schafer	Total
1936	7	0	27	34
37	0	12	43	55
38	0	0	20	20
39	9	22	19	50
40	9	50	20	79
41	20	32	15	67
42	7	30	7	44
43	3	31	10	44
1944	15	30	17	62

The Continental Unit has habitat and range for a considerably larger but undetermined goat population. Though goat winter studies have not been made, critical range problems from use by goats appear

not to exist. The problem seems rather to be: how can the goat herd be increased?

Because so little is understood about year around goat behavior, habits, requirements, range capacity, decimating factors, etc., it is suggested that the next years hunting be regulated with particular care while detailed studies are carried on. These studies would then be on a herd, not subject to uncertain hunting factors, and the desirable herd size could eventually be determined.

Problems Identified:

For Montana the status of other mountain goat herds should be determined as soon as time, funds and personnel are available.

The problems for management of goats in the Continental Unit at present are:

(1) Determine the maximum herd size desirable for the Continental Unit. This would involve a food habit study, plant composition of goat ranges and the carrying capacity for all seasons. Determine the number of goats most likely to survive a year of severe environmental conditions.

(2) To keep census information up to date an annual check by sampling the larger local herds will be necessary. This would build a "case history" for this goat herd with yearly information on herd increase, population status and trends. Relations to severe winters, range plant use and other important conditions will be found. This may be accomplished in part by aerial census and coordinated with detailed ground studies.

(3) Determine food habits and requirements, leading to methods in judging seasonal range carrying capacities for goats and the eventual determination of desirable goat herd size.

(4) For management, seasonal movements by shifts in elevation or between adjacent ranges should be investigated for finding a possible pattern in this behavior. Composition of flocks by season and flock location by season would also give management information.

(5) Life history information on breeding habits and reproduction should be collected as well as size, weight, disease and other data when opportunity is afforded.

(6) In summary the general problem is to obtain a better understanding of the mountain goat in every respect. The Continental Unit has 40% of Montana goats (excluding Glacier National Park), so this would be the area for most work. However, accessibility of other herds, especially during winter months, may make some study in other localities practical.

For mountain goat management, hunting should only be employed as a control measure after a herd has reached the capacity of its range. During years with an open hunting season on goats, a special goat permit should be obtained by the hunter at a reasonable fee in addition to the Big game license (this would take legislative action). The number of hunting permits issued would correspond to the number of goats desirable to be taken from the herd. In this manner the take by hunting could be controlled which is most desirable for a big game species as limited in numbers and distribution as the mountain goat.

During the next years a better understanding of factors involving mountain goat management will be obtained. At present it seems doubtful that any herd in Montana has reached the capacity of its range. Hunting is, therefore, not necessary to keep populations at a desirable level.

At its best in most localities the goat is an unwary game animal; its meat reported least palatable of big game, but its attraction and value as a trophy cannot be overlooked. The nature of its habitat will limit take by hunting to the most ardent of sportsmen. In areas where hunting can never be permitted goats will fit into the scheme of nature and always have value to the recreation seeking public.

(7) Trapping and Transplanting Mountain Goat. In 1941 the Wildlife Restoration Division inaugurated a trapping-transplanting program which included mountain goats. During the succeeding years, including 1946, 48 goats were released mainly in the Crazy Mountains and Beartooth Range, Montana. This work has enlarged mountain goat range by artificial methods. The planted animals have become established and are increasing satisfactorily. These results suggest several other areas which might also be planted with mountain goats successfully and the distribution of this animal further increased. Trapping and transplanting, then, will be a phase of mountain goat management until the species is established in most areas with suitable goat habitat.

The pen type salt trap operated in the spring has proved

most successful. Net and body snare traps are also recommended for use under some circumstances.

In the Continental Unit few areas are suitable for trapping goat. However, the Spotted Bear Mountain, Harrison Creek and Meadow Mountain areas are suggested as possible sites pending further investigation. The Little Salmon Creek lick would yield some goats in the spring as would the Jumbo-Woodtick area. Both are less than a one-day pack from a landing field.

However, with more accessible areas for trapping as the North Fork of Deep Creek and Canyon Creek and the relatively small numbers of goats that will probably be trapped, the remote areas are less practical for trapping operations.

It is suggested the Deer Lodge Management Unit be investigated for trapping sites. The Bitterroot Unit may also have trapping sites.

In the Cabinet Range, Swamp Creek, Rock Creek Lakes and Mt. Headly have been suggested as possible sites for trapping mountain goats.

5. MISCELLANEOUS OBSERVATIONS

Big Game

Elk were the most numerous big game animal in the Continental Unit. There were 754 seen during the summer. Of these 622 elk were seen during July, along the Continental Divide in bands of various sizes, feeding in the alpine meadows and basins at creek headwaters. During August and September few elk were seen, indicating a change of

foraging to the lower timbered ridges, sidehills and creek bottoms.

Mule deer were seen usually ranging at higher open timbered elevations along the base of cliffs and high ridges. Whitetail deer summered at lower elevations along creek and river bottoms and in lower densely timbered localities.

Two moose were seen on the Spotted Bear River. The Middle Fork of the Flathead River is known to have substantial numbers.

Twenty-two Grizzly Bear were seen during the summer. Seventeen of these were ranging along or near the Continental Divide, five were seen on the West side of South Fork Flathead River. Grizzlies were seen in the high country on slopes at timberline or the more open alpine meadows at greater elevations. The eight adults, eight yearling, six cubs (one female, three cubs) seen this summer would indicate the Grizzly is increasing desirably but the fall take by hunting apparently prevents this slow reproducing highly-prized game animal from making a really substantial population increase.

Black bear which frequent the lower timbered country were seldom seen. Only seven were observed all summer.

Following is a list of Big Game seen during the investigation.

	July	August	September	Total
Elk	622	56	26	754
Mule Deer	14	11	29	54
Whitetail Deer	5	12	4	21
Moose		2		2
Grizzly Bear	14	3	5	22
Black Bear	2	1	4	7

Game Birds

Records made on game birds seen included adults, young, number of coveys and average covey size. This data is presented below.

	Blue Grouse			Franklin Grouse		
	Adult	Young	Covey	Adult	Young	Covey
July	10	4	1-4	5	4	1-4
August	28	3	1-3	11	3	1-3
September	27	0	0-0	12	0	0-0
Totals	65	7	2-3.5	28	7	2-3.5

	Ruffed Grouse		
	Adult	Young	Covey
July	4	13	3-4.5
August	20	21	5-4
September	5	0	0-0
Totals	29	34	8-4.25

Furbearers

No furbearers were seen and no information collected.

Predators

Coyotes were found to be most numerous predator. Bobcat probably rank next in abundance. Lynx, mountain lion, wolverine are occasionally present in this area.

6. RECOMMENDATIONS

1. No general open hunting season on mountain goats during the next years while further work determines the desirable herd size. Or if an open season is declared on a limited area, great care should be taken in designating the boundary of the open section as well as

controlling and checking the hunting activities.

2. An annual follow-up census be made by sampling local herds to keep the goat herd status up to date and build a "case history" for the Continental Unit.

3. Food habit studies be conducted in the next years with the objective of devising methods to judge goat range carrying capacity and determine any critical seasonal use.

4. Seasonal movements between adjacent ranges and shifts in elevation be traced for a better understanding of goat distribution.

5. A pregnant female be trapped early in April and kept under observation to determine date of birth, kid growth to yearling size and related information be recorded.

6. Life history data, weight, size information be collected when the opportunity is afforded.

SUMMARY

A preliminary investigation of Mountain Goats was made during July, August and September, 1946, in the Flathead-Sun River, or Continental Big Game Management Unit, Montana.

The objective of this work was to conduct a mountain goat census, determine local summer distribution, herd status, identify problems of management and collect all possible life history data.

A three man crew was assigned to conduct this investigation. Travel for field observation was routed through mountain goat habitat in that section of the Continental Unit formerly open to hunting.

One hundred thirty-three miles were made on foot during July, proceeding north along the Continental Divide; in August one hundred twenty-two miles of observation on the east side of the South Fork of the Flathead River; September, one hundred eighty-eight miles west of the River, totaling four hundred forty-three miles for the season.

The Montana mountain goat (Oreamnus americanus missoulae) can be generally described: medium sized (smallest of the forms) with short, erect horns curved slightly backward; pelage long and white with wooly underfur, short beard on chin; tail short, teats four.

Distribution was found to be largely between 6750-8350 feet in elevation. Males tended to range more at lower elevations and the female-kid groups oftener at higher elevations, particularly during July.

Distribution by exposure seemed least significant, but a possible favoring of eastern exposures was noted.

Summering mountain goats frequent cliffs and the vicinity of cliffs on moderate to steep slopes.

Goats were observed most frequently feeding in alpine meadows which would also indicate the most used plant species are to be found in these sites.

More than three-fourths of seen mountain goat were 1/2 mile or less from water.

Daily activity of goat was largely alternating periods of feeding and bedding down.

Seasonal movement does occur, but it was not determined whether

this movement is a shift in elevation and/or between adjacent ranges. Spring travel to licks is known to be extensive.

Mountain goats are gregarious; the sex and age composition of local herds vary with the season. Largest group of female-kid, yearling composition were seen in July, tending to break up later in the summer.

Goats were observed bedded at all hours of the day.

Caves and other shelters were found to be used by goats some seasons of the year, but use not observed during summer 1946.

Dusting is an occasional goat habit. This behavior observed once in August.

Natural and artifical licks are used by goats during the spring and early summer.

No food habit determinations were made during the investigation.

Breeding habits and reproduction behavior are not known in Montana.

Forage on mountain goat summer range appeared plentiful.

No evidence of predation was found during the investigation.

The 1946 estimated goat population for the Continental Unit was 1715 head.

337 mountain goats were seen; 235 adults, 36 yearling and 46 kids.

The apparent herd increase for 1946 was 16.9%.

Assuming 1946 kid crop same as 1945, the first year mortality

would be 25%.

The Continental Unit apparently has range and habitat for a larger goat population.

The maximum goat herd size desirable for the Continental Unit should be determined.

An annual census check by sampling is necessary for up-to-date information on the goat herd status.

Determination of food habits will be necessary to find methods for judging seasonal range carrying capacity for goats.

For management, seasonal movements should be studied.

The general problem is to obtain a better understanding of the mountain goat.

Trapping and transplanting mountain goat is an important program in Montana for increasing distribution in desirable areas.

There were 754 elk, 54 mule deer, 21 Whitetail deer, 2 moose, 22 Grizzly bear, 7 Black bear seen during investigation. Also 72 Blue grouse, 63 Ruffed grouse and 35 Franklin grouse.

JUN 4 1970

REFERENCES

Anthony, H. E., 1928 Field Book of North American Mammals, G. P. Putnam's Sons, New York, pp. 547-549

Bailey, Vernon, 1918 Wild Animals of Glacier National Park, Gov't Printing Office, Washington, D. C. pp. 28-31

Caffrey, W. S., 1941 The Effects of Winter Browsing. South Fork of The Flathead River, Montana, Journal Wildlife Management, Vol. 5, No. 4, Oct. 1941, pp. 427-453

Gray, Prentiss N., 1946 North American Big Game Official Measurement Records, Remington Arms Co., Bridgeport, Conn.

Harmon, W. H., 1944 Notes on Mountain Goats in the Black Hills, Journal of Mammology, Vol. 25, No. 2, May 1944

Montana Fish & Game Commission, Wildlife Restoration Division Reports (not published)

1940	Sun River Elk Herd, R. F. Cooney (not Wildlife Restoration Division report)
1941	Grizzly Bear, Mtn. Goat Survey, R. F. Cooney
1941-42	Report of Winter Game Studies Middle Fork and South Fork of Flathead River, Field Crew.
1942	Grizzly Bear, Mtn. Goat Survey, W. K. Thompson
1942	Bitterroot (Winter Game Work), Geo. Hollibaugh
1943	Rocky Mountain Bighorn Sheep Study, Faye Couey
1943-45	Cumulative Record of Big Game Data
1944-46	Mtn. Goat Trapping & Transplanting Records
1946	Trapping & Transplanting Mtn. Goats, W. K. Thompson
1946	Aerial Check-Mountain Goat Range, Continental Unit, R. F. Cooney

Seton, E. T., 1929 Lives of Game Animals, Doubleday Doran & Company, Inc., New York, Vol. III, Part II, pp. 470-519

Swift, L. F., 1940 Rocky Mountain Goats in Black Hills of South Dakota, Transactions of the Fifth North American Wildlife Conference, American Wildlife Institute, Washington, D. C., pp. 441-443

U. S. Forest Service, Region Four, 1946 Wildlife Management Study Course. Mimeographed, Part I, pp. 27-28

Washington State Game Commission, 1938-39 Fourth Biennial Report Washington State Game Commission, Seattle. 1940 Mountain Goat Study Progress Report. Biological Bulletin No. 2 by N. A. Anderson, Washington State Game Commission, Seattle, 21 pages.

AERIAL CHECK - MOUNTAIN GOAT RANGE

(South end of Continental Unit - Sun River-Flathead)

DATE: July 26, 1946

PERSONNEL:

Robert F. Cooney, Director, Wildlife Restoration Division - Observer

Harlen Herrin - Pilot

PURPOSE:

This short aerial check was planned to cover the Continental Divide from Scapegoat north to the Nolley Creek-Indian Creek Pass. It was found desirable due to the fact that the mountain goat field crew reported that they had seen very few goats in this area. As it was felt that the region presents very ideal habitat, it was thought that a recheck would be very worthwhile. This information was necessary to supplement the mountain goat report that is being prepared for the Sun River-Flathead region (Continental Unit).

FLIGHT DATA:

At 4:30 A.M., the two men left the Helena airport in a two-place, side-by-side, Aeronica. The flight was in a northerly direction to Scapegoat Mountain. From this point, as careful an aerial coverage as possible was made along the Continental Divide to and including the Nolley Creek-Indian Creek Pass.

A recheck of the area was made on the return trip. Two hours and

fifty-five minutes of flying time was consumed during the work.

FINDINGS:

There were no goats seen on Scapegoat Mountain, although it apparently presents very ideal habitat.

Six mature goats were located on top of Triple Divide Mountain at the headwaters of the South Fork of the Sun River - time 6:00 A.M. All of these goats were lying down at the edge of an expansive alpine plateau-type meadow in close proximity to a sheer drop off of several thousand feet. Two of the goats got up as the ship passed over.

The ship circled over Sugarloaf Mountain at an elevation of about 300 yards above the plateau-type top. Two large mature mountain goats were seen on the east edge of this alpine plateau. These two goats were feeding. They paid little attention to us as we flew over. Time was 6:05 A.M.

There were no goats seen on Headley Reef, Grizzly Basin or in Pearl Basin.

Unfortunately a wind was blowing, perhaps 20 to 25 miles velocity, at the elevation the ship was traveling, so that the dangerous down-draft condition had developed along the east face of the Continental Divide. For this reason, it was impossible to travel as close to the reefs as would have been desirable under better weather conditions. It is felt, however, based on the goats seen, that others could have been quite readily detected had they been in the areas under observation.

One goat, apparently mature, was seen on a natural lick on the North Fork of Ahorn Creek near the Continental Divide. This is a lick that is not recorded, and as far as known at this time has not been previously

observed. Trails leading into it indicated rather heavy usage. It resembles very closely, the goat lick which is used during the spring and early summer in the Wood Creek-Ford Creek vicinity, just south of the Beech Park road. Apparently a seep of water oozes out of a blue shale formation.

Eight mountain goats were observed on the top of the Red Buttes, approximately 1/4 mile from Hermit Lake. This group was made up of mature and young animals, however, at the altitude the ship was flying at that point, it was impossible to get an accurate break-up of age classes. All of these goats were lying down. The time was 6:20 in the morning.

CONCLUSIONS:

It was concluded that the use of a small two-place airplane would be quite practical and no doubt quite successful in the observation of mountain goats along the Continental Divide during early morning hours when the wind is not blowing over a 10 mile velocity. Stronger winds create down-draft conditions which prevent traveling as close to the east side of these reefs as would be desirable.

It is still felt that there must be more goats in the area covered than were observed either from the ground or from the air.

RECOMMENDATIONS:

It is recommended that a further check of this area be made as it is relatively convenient to the Helena airport. Every effort should be made, however, to ascertain weather conditions and wind velocity in the area prior to this second flight.

Submitted by:
Robert F. Cooney, Director
Wildlife Restoration Division

July 26, 1946

8 - Goats 6:20 AM

1 - Goat 6:15 AM

2 - Goats 6:05 AM

6 - Goats 6:00 AM

MONTANA

FISH AND GAME DEPARTMENT

Reconnaissance Map

M/H. Goat Investigation by Air

R.F. Cooney

July 26, 1946

CRAZY MOUNTAINS

GOAT CENSUS

July 5 to July 11, 1946

The trip began on July 5th and extended through July 11th. Due to inclement weather we were at a disadvantage for sighting goats.

Beginning at the Brannin Ranch, we traveled north into Blackaby Creek and up the South Fork of American Fork Creek to its source. The south rim of this canyon is excellent goat country; due to the rough going up to the large grassy slopes above timberline. Domestic stock do not habit this area at any time. Because of the more easily accessible timbered area with spacious open parks, the deer seldom bother to climb beyond timberline, thus leaving an area with an abundance of food which could be marked "for goats only". Winds throughout the year make this area an ideal game habitat in that the high slopes and ridges are always clear of snow, while the craigs and ledges always offer good protection.

Returning from the head of the South Fork of American Fork by way of the Middle Fork, took us out of the good goat country and into the deer and bear area. Many deer signs were seen here, supplemented by seeing 47 deer; on fullgrown brown bear; and two widely separated bear droppings were observed.

The next trip up the Sweetgrass was stymied by low clouds, rain, and snow so we contacted ranchers running cattle in the northern end of the Crazy Mountains relative to seeing any goats, but found no evidence

of any ever being there. This led us to believe the goats were staying in the immediate vicinity of the planting which offers the best cover and food of any place in the mountains.

A trip along the rim of the mountains lying between American Fork and Sweetgrass Creek on foot, provided a close-up view of the country in which the goats spend most of their time. Many tracks, droppings, and two goats were seen here in the little time we had to observe when we were not crawling on our hands and knees attempting to penetrate their domain. Mr. Brannin had placed sulphur salt blocks along this rim, some of which showed use and others did not.

A trip up Sweetgrass Creek and into the head of Willy Creek on Foot, brought us into some of the best goat country yet seen. While we did not actually catch a glimpse of any of these animals, we saw definite tracks of 7 head near the salt grounds. These goats left the salt ground as we approached or shortly before as their tracks were made subsequent to the rain in the early morning.

On Willy Creek we observed approximately one half of a salt block having been consumed by the goats and about one quarter of another. This amount of salt was consumed in less than 4 weeks. The absence of any deer tracks in the vicinity led us to believe the goats were the only animals using the salt grounds during the past year. Four blocks of salt were consumed at this salt ground during the year.

One interesting observation was made at the salt ground; that was, the plant life within six inches of each salt block was eaten down to the roots and in some cases some of the dirt had been eaten. Evidently the

wind and rain action on the salt block causing it to erode and cover the plants make them highly desirable to the animal.

Evidently the two goats mentioned as having gone to the low country during the winter were males. One was roped by one of the local ranchers and proved to be a male and the other was photographed at very close range and certainly appears to be a male. It is generally assumed that these two were driven from the herd as sometimes happens in domestic stock.

In contacting ranchers, hunters, and especially Barney Brannin, we obtained the following observations of goats during the past five years.

April 14, 1941 (Brannin)
4 head of goats (one kid) on lower Sweetgrass Canyon, one mile below Tower Falls, 1 goat at Saw Mill on Sweetgrass Creek.

April 24, 1941 (Rubotton)
2 goats at mouth of Hell Roaring Creek

June 14, 1941 (Brannin)
3 goats at Tower Falls

July 7, 1942 (Fallang)
2 goats and one kid at Tower Falls

November 2, 1942 (Brannin)
2 goats and one kid at Tower Falls

May (1943) (H.Daly)
Afore mentioned goat that came to low country seen on Otter Creek 8 miles southeast of planted area. Returned to mountains next day.

April 20, 1943 (Brannin)
1 goat one mile south of ranch

June 13, 1943 (Brannin)
2 goats at Tower Falls on Sweetgrass Creek

August 21, 1943 (Richardson)
8 goats (2 kids) five miles south of area planted.

September 21, 1943 (Fallang)
4 goats and 4 kids on north fork of Sweetgrass Cr
lame goat appeared to have twins.

October 14, 1943 (McDowell and Brannin)
2 goats and 1 kid at Tower Falls

October 15, 1943 (Deer Hunter)
4 goats on head of Blackaby Creek.

October 16, 1943 (Halvorsen)
1 goat at Tower Falls

April 30, 1944 (Brannin)
3 goats at Tower Falls

June 11, 1944 (Brannin)
1 goat and 1 kid at Tower Falls

July, 1944 (Brannin)
Goats cleaned up 3 salt blocks in less than 10 weeks at Milly Creek. A lot of goat hair and tracks noted.

July, 1944 (Rubottom and Richardson)
5 goats and 4 kids on South Fork of Sweetgrass. Stated 1 pair of kids appeared to be twins.

August 15, 1944 (Brannin and dudes)
1 goat and 2 kids at Hinder Lake

August , 1944 (Fellang)
4 goats on Lake Mountain

December, 1944 (Fur Trapper)
3 goats at Swamp Lake on south end of Crazy Mountains. (Mr. Cole in the drug store at Big Timber says this man might say anything at anytime so it is considered doubtful he saw anything but deer.)

October 5, 1945 (Rubottom and Anderson)
2 goats and 2 kids appeared to be one old nanny, 1 yearling and a set of twins at Hinder Lake

Barney Brannin spent most of the year of 1945 in the hospital, thus the absence of observations and reports.

May 17, 1946 (Brannin)
7 goats at Tower Falls

May 26, 1946 (Brannin)
4 goats at mough of Milly Creek near Tower Falls

June 16, 1946 (Brannin)
2 goats on Coyote Creek

June 23, 1946 (Brannin)
9 goats on head of Bear Creek, 4 of them were kids.
11 goats on Milly Creek, 6 of them kids. Mr. Brannin thinks all 10 kids seen were 5 sets of twins.

June 26, 1946 (Brannin, Johnson, Brown)
4 goats on Sweetgrass - American Fork Divide

July 7, 1946 (Brown)
4 goats - appeared to be 1 nanny, 1 yearling and 2 kids, seen at head of Miners Creek.

July 10, 1946 (Salinas and Brown)
2 goats at mouth of Milly Creek

With the exception of the questionable goats at Swamp Lake, the two males that came down to the foothills and those seen at Lebo Mountain, no goats have been seen more than 5 air-line miles from the original area of release.

In trying to cover too large an area in a very short time, we missed seeing many goats. If it were possible to set up a camp or camps on a few vantage points and with the use of a high-powered telescope a much more accurate census could be taken.

Poor trails full of down-timber and snow banks prevented us from getting into many areas on horseback and to walk into these areas would consume too great an amount of time.

It is our plan to return to the Crazy Mountains at a later date, after the snow is gone.

- - - - - - - - - - -

In covering the plant phase of the goat trip into the Crazy Mountains, my results were reduced, but three valuable lessons were learned: In that: (1) a "Key" is invaluable, and regardless of the

difficulty in reaching an area, the lightness of the load one desires to carry, it must be on hand at all times, or (2) a plant-carrying container and (3) a press is necessary if one is to determine species later on.

We gathered several specimens but our method of carrying, shirt and jacket pockets, were so poor that identification later on was practically impossible. So, without further alibis and apologies the observations will follow.

It was interesting to note that, as far as the herbs were concerned, the greater number of the species present at the lower elevations were also present where plants existed at the highest elevations, but that the grasses were reduced to apparently two or three species and supplemented with the sedges, which, to me, was quite a surprise as I was under the impression that they were characteristic of lower swampy areas.

At the higher levels, where the greater amount of goat sign was apparent, the following were most abundant: tufted phlox, but no evidence that blossoms had been harvested, sedge, fescue muhley (?) gland cinquefoil, pentstemon, crigeron townsendia, snapdragon, alpine timothy, bitter brush (?) or a close resembler.

At timberline and lower the same plants were found plus bearberry, cogswellia, western yarrlow, saxifriga micropetala, pussytoes, ceanothus, and lupine.

Observations were made to determine the plants being used by the goats upon several occasions and despite signs indicating the use of from several, to many, head it was disappointing to find

with no exception, and that was near a salt ground where sedge had been cropped.

Submitted by:
Don L. Brown, Fieldman
Wildlife Restoration Division

July 20, 1946

ACCORING®

1/2 INCH CAPACITY RINGBINDER

FR1B 250 RED	SR1B 250 TURQUOISE
GR1B 250 BLACK	QR1B 250 PALM GREEN
DR1B 250 GREY	XR1B 250 EXECUTIVE RED
PR1B 250 GREEN	ZR1B 250 DARK GREEN
UR1B 250 BLUE	AR1B 250 TANGERINE
YR1B 250 YELLOW	BR1B 250 ROYAL BLUE
R1B 250-D20	ASSORTED DISPLAY